

71. *TRINGA SUBARQUATA.*

Tringa subarquata, Sharpe & Bouvier, Bull. Soc. Zool. France, i. p. 313 (1876); Seebohm, Geogr. Distr. Charadr. p. 419.

Aruwhimi River.

A young bird in winter plumage. It has been found on the Lower Congo and probably follows the course of that river on its winter migration.

72. *TRINGOIDES HYPOLEUCUS.*

Actitis hypoleuca, Sharpe & Bouvier, Bull. Soc. Zool. France, i. p. 18 (1876).

Totanus hypoleucus, Seebohm, Geogr. Distr. Charadr. p. 371.

♀ ad., Yambuya.

XVI.—*On some of the Birds of the Sandwich Islands.*

By SCOTT WILSON, F.Z.S.

(Plate VI.)

It may be advantageous to preface these notes by a few geographical remarks as well as by a slight sketch of the leading physical features of the islands of the Hawaiian group, and especially of their forests, with which the existence of their feathered inhabitants is so closely bound up that the destruction of the one involves the extinction of the other. It is, alas! only too probable that both are doomed in a very near future, so that these notes will possess a melancholy interest for naturalists; but it will be quite needless for me to add another to the many descriptions already published of these lovely islands*.

Anyone turning to Mr. Wallace's 'Island Life' (chap. xv.) will see that the Sandwich Islands form one of the most remote groups in the world, rising from ocean-depths which average about 3000 fathoms, whence Mr. Wallace infers that during the whole of their existence they have been as com-

* Of late they have been brought into prominent notice owing to the heroic devotion of Father Damien, the martyr of Molokai.

pletely severed from the great continents as they are now. Indeed they lie some 2100 miles from the nearest point in the American continent (San Francisco), and they are at about the same distance from Samoa and the Marquesas on the south, and from the Aleutian Islands towards the north, though some widely scattered reefs and atolls, six or seven hundred miles off, serve to connect them with the other Pacific islands.

The Hawaiian group stretches from south-east to north-west for about 350 miles; but though so extensive, it is entirely volcanic and its principal island possesses two active volcanoes, the lava-streams from which render a large part of its area a treeless and barren waste. There are eight inhabited islands—Hawaii, Maui, Oahu, Molokai, Lanai, Kahoolawe, Kauai, and Niihau. Of these, Kahoolawe and Niihau, the two smallest, have no forests remaining. Hawaii is the most southerly and by far the largest of the group, having an area of 4100 square miles, and being well compared by Mr. Wallace to Devonshire, “with which it closely agrees both in size and shape, though its enormous volcanic mountains rise to nearly 14,000 feet high.” Maui, Oahu, and Kauai, each about the size of Hertfordshire or Bedfordshire (again to use Mr. Wallace’s comparison) come next in point of area, and these are followed by Molokai, Lanai, Niihau, and Kahoolawe in the order here named.

On my first visit to the large island of Hawaii (coming from Honolulu) in May 1877, I landed at Kealeakakua Bay, on its west coast, the scene of Captain Cook’s unfortunate death. Throughout the district of Kona, as this part of the island is named, the forest begins at an elevation of about 1100 feet, and stretches for some six miles up the slopes of the great mountain Mauna Loa (13,700 feet). For some considerable distance the more abrupt slopes of Mauna Hualalai (8275 feet) are also covered with dense forest. A great portion, however, of this island, especially the region from the sea-board to 1100 feet, is, as already stated, a desert waste of beds of clinkers and of lava-streams, which have rolled down to the sea from its three great volcanos—

Mauna Kea (13,805 feet), Mauna Loa, and Mauna Hualalai—and accordingly the total extent of forest is comparatively small. Most parts of the interior are thickly wooded to an elevation of about 6000 feet, above which the ohia trees (*Metrosideros polymorpha*) become mere scrub, and other forest-trees disappear entirely. Certain districts, even of the interior, as, for instance, the vast grassy plains of Waimea, have been entirely denuded of wood, partly through the ravages of feral cattle, partly through fires and other causes quite independent of volcanic action, so that the forests occupy at the present time but an inconsiderable extent of this island. Moreover the existing wooded region is becoming smaller year by year, owing to the countless herds of cattle which roam through its depths and have already so thrown it open that the impenetrable jungle of primeval Hawaii is a thing of the past. It is to be feared that if no check is put to the depredations of these destructive animals, and if trees are not planted to replace the great tracts of mighty giants which, in certain districts, are dying by hundreds, the forests of Hawaii will, at no distant date, become a matter of history. I am glad to say that several large land-owners are becoming alive to this danger, notably my friend Mr. W. H. Purvis, who, being an excellent botanist and practical tree-planter, has been one of the first to recognize the extreme danger of allowing this disforestation to go on, and who, by fencing in his lands against cattle, will assuredly by this wise proceeding preserve some part of the forest, and with it its many interesting birds, for the study of naturalists. I feel sure that all intelligent residents will agree with me that these beautiful islands, well named “the Paradise of the Pacific,” would lose much of their charm were their native birds, conspicuous for the brilliancy of their plumage, and remarkable from their peculiarities, to be replaced by the noisy Mynah, the pugnacious Sparrow, and the Singapore Dove, all of which introduced species have already obtained a firm footing on the island of Oahu, and now fill its wooded ravines, formerly the home of far rarer and more beautiful species.

I have gone at some length into this question, as, by so doing, I may draw to it the attention of the Hawaiian Government, as well as that of the large land-owners, and their combined action cannot be too soon brought into effect if the entire disforestation of the Hawaiian Archipelago is to be prevented. It would be a disgraceful thing if such a Garden of Eden should be bereft of its birds, more especially as I am convinced that these islands have a great future before them as the great health-resort for the inhabitants of San Francisco flying from its unhealthy and treacherous climate, to say nothing of the vast number of tourists who will flock, in yearly-increasing numbers, to see the volcanic wonders of Hawaii, from all quarters of the globe. All these visitors may be expected to take an intelligent interest in the avifauna of the islands they visit or make their home, and on their behalf I appeal to the land-owners and to the Legislature of Hawaii to unite in protecting their country's birds. I would suggest that not only should forest-lands be fenced in as far as practicable, but that *no* exotic birds should be introduced. Several species of Hawaiian birds, which were to be found in Cook's time, and others which were obtained even so late as 1840, have become extinct, and it would not be rash to say that ere another century has elapsed but few native species will remain.

After this exordium, I will now attempt to give my readers some idea of the aspect of a Sandwich-Island forest. I shall enumerate the principal trees, more especially those which are frequented by birds that enliven the sublime solitude of the forest depths with the sweet ripples of their music—music “which gentlier on the spirit lies than tired eyelids on tired eyes.” The ohia (*Metrosideros polymorpha*) is the queen of Hawaiian forest-trees, often attaining a height of from 90 to 100 feet, with a bole large in proportion. These giants are generally encircled to the greater part of their height by a climbing tree (*Freycinetia arborea*), which seems literally to coil around them, while its scarlet-tufted bracts and showy red fruit add yet another shade of colour. The ohia belongs to the *Myrtaceæ*, but the white stamens of the myrtle are

here replaced by crimson of the most brilliant hue, or in some varieties by orange, and in others by creamy buff. The crimson-flowered variety is, however, by far the most general, and the colour of its blossoms is only rivalled in brilliancy by the bright plumage of two species of birds I shall presently more particularly mention, both of which are ever to be seen sporting among its branches and probing its highly-coloured flowers for the nectar, as well as for the insects, which they contain. The ohia attains its greatest size in the lowest forest zone, from 1100 to 2500 feet, but it is to be found as high as 6000 or even 8000 feet. It well deserves its specific name, as one would at first hardly recognize the stately forest giant as belonging to the same species as the low-growing stunted shrub found in the mountain-region, were it not that these bushes, dwarfed as they are, are often a blaze of crimson flowers, being more floriferous than the forest-trees. The stunted ohia bushes found in the mountain-region have often a particularly dingy appearance, which still further disguises their identity. This peculiar appearance is due to a fungus (*Fumago vagans*, Pers.), a species which Mr. George Murray, of the British Museum of Natural History in Cromwell Road, has kindly identified for me, informing me that it is widely distributed throughout Europe and North America.

Next in importance, both in size and quantity, comes the koa (*Acacia koa*); and this, if the candle-nut (*Aleurites triloba*) is excepted, is the only other forest-tree worthy of the name. The koa, unlike the ohia, is never found in the lower forest-zone, nor does it occur as a shrub in the upland region. I think this fine acacia seldom grows below 3500 nor much above 5000 feet. In the comparatively dry soil at an elevation of about 4000 to 5000 feet it flourishes best, and in this region attains a great size. It is not so lofty as the ohia, and has a much more spreading habit than that tree; its bole is nearly equal in circumference to that of the ohia, and it was from gigantic specimens of this tree that the natives used formerly to hollow out their large war-canoes. The wood is very hard and extremely durable; it

takes, moreover, a high polish and is beautifully grained; indeed, in the opinion of experts its superiority over mahogany is undeniable, and I must say that some cabinets made of koa in the possession of the King are of extreme beauty. This fine forest-tree has a smooth trunk and large acacia-like leaves, which, in colour, resemble those of the *Eucalyptus*, but in certain lights possess a peculiar lustre of their own. It has an inconspicuous flower, but its bean is large, being some eight inches in length; still neither its flower nor fruit are any attraction to birds, and it is for the insect-life alone, found among its branches and among the mosses which deck them, that several species of birds frequent its feathery groves.

The next tree in point of size to the two already considered is the kukui or candle-nut (*Aleurites triloba*), a widely-distributed Polynesian species, but in the Hawaiian Archipelago only found in large tracts on the island of Kauai, although it is met with on all the other islands. The only birds I have ever observed to frequent its groves are the several species of *Chasiempis*, and occasionally *Psittirostra psittacea*. The kukui, though not much frequented by birds, deserves a word of mention, as the swelling park-like country of large districts on the island of Kauai owes much of its beauty to the stately clumps of this handsome tree. The delicately-indented foliage of the kukui has, like that of the koa, a lovely silvery appearance in certain lights, and its compact tree-like foliage and gracefully-shaped leaves earn for it the palm of beauty amongst Sandwich-Island trees. I may mention incidentally that its ribbed nuts are largely used in the manufacture of native jewellery, and also that the same nuts pounded are considered to be a great aid to digestion.

Besides these three, the undergrowth of a Sandwich-Island forest is chiefly composed of the following, their frequency of occurrence being indicated by the order in which their names are given:—The alii (*Dodonaea viscosa*), the aaka or neia (*Myoporum santalinum*), the iliahi or sandalwood (*Santalum album*), which is very local, the mamané (*Sophora*

chrysophylla), confined to the higher region of Hawaii only, the ohia ai (*Eugenia malaccensis*), another very local tree, but the deep green foliage and pink fruits of which combine to make it very attractive. To these must be added the numerous species of gigantic tree-lobelias and the huge tree-ferns, which latter are often over twenty feet in height and four to five feet in circumference, the dark brown stems and feathery fronds adding greatly to the beauty and tropical aspect of a Hawaiian forest. These ferns are, moreover, interesting from an ornithologist's point of view, as being the favourite hunting-ground of the Akihiloa (*Hemignathus obscurus*), which bird finds a soft material for its slender bill to work in, and also insects innumerable, in the brown stems of these graceful plants.

I have now enumerated most of the trees to be found in any quantity in the island of Hawaii, which may be said to be fairly typical of the entire archipelago, although, as is the case with its avifauna, the several islands each possess peculiar species. But I must leave this for my forthcoming work, in which I propose to describe in detail the forests found on the different islands of the group.

Although these are the principal trees constituting a forest on Hawaii, one must not pass over the numberless creepers which, especially in the lower and damper forest-zone, hang in festoons from tree to tree, and thus form a complete network of graceful greenery. Nor must one omit to make mention of that most graceful of Hawaiian ferns, *Gleichenia hawaiiensis*, to the tangled masses of which is due the impenetrability of parts of the forests on the Sandwich Islands, and especially on Lauai, which possesses but few feral cattle. This fern seems to revel alike in damp and dry soil, as it is as often found in great masses on the comparatively dry sides of the steep ravines, as in great fantastic festoons hanging over the forest streamlets. The filmy ferns and the moisture-laden mosses, which find their homes on the tree-trunks in the sombre forest-depths, are interesting alike to the botanist and to the lover of the beautiful in nature. And it is in a great measure to the numerous

species of ferns and graceful creepers that a Hawaiian forest owes much of its beauty, though one cannot help lamenting the absence of epiphytal orchids, which form such a lovely feature in many tropical forests. In some few favoured spots the broad-leaved banana rears its stately head, and here, in these sheltered spots, its grand leaves are perfect in their beauty, not torn to ribbons by the blustering wind, as one sees them around Honolulu and in other exposed positions. Among other fruits found in the lower forest-zone are the prolific guava, the orange, and the mango, on the fruits of all of which in their season certain birds delight to feed.

But now to turn to the birds which inhabit the forests whose beauties I have just endeavoured to indicate. I intend the present paper as a slight sketch to be elaborated in the large work which in due time I hope to publish on the ornithology of the Sandwich Islands; and accordingly I shall not here attempt any critical examination of the distribution of the species among the different members of the group, nor to treat any of the species in an exhaustive manner. Indeed, on this occasion, I shall merely mention a few, of which my knowledge is, I trust, sufficient to guard me against the commission of any grave errors, while most of them are also birds concerning which I do not expect to gain much more information from investigations which, at my request, are still being carried on in regard to other species.

I may add that what I have to say of the habits of the birds is derived entirely from my own observations.

1. *ACRULOCERCUS** *NOBILIS*. "O-O."

This, the Royal Bird of modern times, is perhaps the best known of any species to both the natives and foreign resi-

* As, in my forthcoming work, I intend to adopt Prof. Cabanis's generic term *Acrulocercus* in place of *Moho* or *Mohoa*, one or the other of which has been commonly used, I may here give my reasons for preferring the former. Prof. Newton has pointed out to me that, as a generic name, *Moho* dates only from Gray's 'Genera of Birds' (i. p. 96) in 1847, in which year Prof. Cabanis published *Acrulocercus* (*Archiv für Naturgesch.* xiii. p. 327). Gray was careful not to quote *Moho* as a "genus" founded

dents in the islands. It is doubtful whether in ancient days it was from the yellow feathers that grow beneath its wings, or from the still more beautiful yellow feathers of the now extinct *Drepanis pacifica*, next to be mentioned, that the state robes of kings and chiefs were wrought. It was the privilege of those classes alone to wear them; and it cannot be denied that they formed a becoming apparel, as magnificent and beautiful as anything that the triumphs of civilized art can now produce. The fine statue of King Kamehameha I., which stands in front of the Government House in Honolulu, represents the great conqueror who first consolidated the sovereignty of the various islands, draped in his *Mamo*—as this feathered cloak is called in the Hawaiian language—and its texture is wonderfully represented by the sculptor's art. Looking upon it, and remembering that the kings and chiefs of Hawaii-nei were a race of giants, most of them being over six feet in height, we can well understand what an imposing effect must have been produced by one of them thus clad. The fabrication of the great yellow war-cloak of Kamehameha I. had been going on through the reign of eight preceding monarchs. The ground-work is of coarse netting, to which are attached, with skill, now impossible to be applied, the delicate feathers, those on the border being reverted. Its length is four feet,

by Lesson (Tr. d'Orn. p. 302) in 1831, as has been commonly supposed; and, indeed, those who turn to Lesson's work will find that he simply under this name indicates a group of the genus *Philedon* of Cuvier, and abstains, both in this passage and in his later work of 1837 (Compl. Buffon, Oiseaux, p. 149), from using *Moho* in a strictly generic sense. The amendment of *Moho* into *Mohoa*, proposed in 1852 by Reichenbach (Handb. sp. Ornithol. p. 333), brings the name dangerously near *Mohoua* of Lesson (1837), which is as valid or invalid as his *Moho*. Furthermore it is certain that *Moho* applied to this bird originated in an error, possibly a misprint for "Hoho"—an old form of writing its native name—perpetrated by Ellis (Narrat. Voy. Cook and Clerke, ii. p. 156) in 1782, unfortunately repeated by Latham (Gen. Synops. Suppl. p. 120), and thence copied by Sonnini (Hist. Nat. Buffon, xviii. p. 286) and others. "*Moho*" is the Hawaiian name for *Rallus ecaudatus*, King, and applied to any other bird only excites a smile.

and it has a spread of eleven feet and a half at the bottom, the whole having the appearance of a mantle of gold. The examples of the cloaks and capes which I examined were all of the lighter shade of yellow which belongs to the feathers of the present species; and though it is possible that those of both this and *Drepanis pacifica* were used indiscriminately, one can hardly doubt that the preference would not be given to those of the latter, so long as they were procurable.

The ancient kings had a regular staff of bird-catchers, who were expert in their vocation. They made use of the sticky juice of the bread-fruit, called in Hawaiian "Pilali," and of the tenacious gum of the fragrant "olapa," a common tree in some parts of the forests, smearing the stuff about the branches of a flower-covered ohia, often fastening an example of the scarlet *Vestiaria coccinea*, of which more presently, as an additional attraction to the Royal Bird, whose pugnacity was well known; and in his eagerness to attack his brilliant rival, he would fall an easy victim to the device. That large numbers of the O-o must have been taken in old days is clear from the numbers of "leis," or wreaths of feathers, that now remain in the possession of the natives, who still set so great a store by them that it is but rarely that a traveller is able to purchase one as an interesting relic of a past state of things. I was fortunate in obtaining a small one at the price of fifty dollars, for the construction of which it is reckoned that two hundred birds must have been sacrificed. The Hon. C. R. Bishop possesses some very fine examples, and the contents of a small tin box of them I estimated at being worth ten thousand dollars. What the value of a cloak or cape may be it is impossible to say. At the ceremony of opening the Hawaiian Legislature in 1888, two capes were donned by two of the native officials, and very imposing they looked, though the effect could not be compared with that produced by the flowing war-cloak.

This very striking and, to Hawaiians, most interesting bird is preeminently a Honey-sucker, extracting the nectar

with its long tubular tongue from the flowers of the ohia and from the great tree-lobelias, of which the curved tubular corollas are perfectly adapted in shape to the O-o's bill ; and though I have on several occasions observed it feeding on the fruit of the banana, I believe honey to be its principal sustenance. In a state of captivity it has been kept with success by feeding it on the juice of the sugar-cane.

It has a very peculiar call-note, whence its native name is derived ; but here I may insert some extracts from my notes taken in the district of Kona, where it is still fairly common :—

“ We shot two O-os to-day ; but these birds are extremely difficult to obtain, as they are constantly on the move from tree to tree, hardly ever at a less height than 90 feet from the ground. Their cry is somewhat harsh and resembles the sound of the letter O, repeated twice, with a well-marked pause between ; it is, however, extremely difficult of imitation by the human voice. The yellow axillary tufts are very conspicuous when this bird is on the wing, and its dipping mode of flight somewhat resembles that of the Magpie, while its long tail still further suggests a resemblance to that bird. The O-o exhibits a decided preference for the extreme top of any tree on which it alights, and when thus perched may be seen continually jerking its long plume-like tail up and down at a right angle to its body, all the while uttering its harsh cry.”

As mentioned above, it is an extremely wary bird and most difficult of approach when met with in the ohia-forest, so that the only occasions on which I was enabled to watch it at close quarters were amongst the foliage of the arborescent lobelias, of which plants it is particularly fond.

The males vary considerably in length, the finest specimen I obtained measuring 13 inches from bill to tip of tail ; but most of those I shot were considerably smaller. The female is smaller than the male. I never obtained a bird in immature plumage, nor did I find a nest ; but from its evident preference in the breeding-season, May and June, for the topmost branches of the lofty ohia trees, I conclude that it

chooses its nesting-place amongst their highest branches, which are some 90 to 100 feet from the ground. I venture to say that its nest will never be taken, as not even a Hawaiian, bold, skilful, and withal utterly reckless climber as he is, would be able to scale these forest giants.

The ordinary vertical range of this bird is from 1200 to 4000 feet; but I am told by my friend Mr. Ashford Spencer that he has observed it at certain seasons of the year in the forest around the sheep-station of Kalicha, which is above 6000 feet.

It is probable that the O-o, like other birds, follows its food, migrating to this high mountain-region as soon as the ohia tree is out of flower in the lower forest-zone.

I only met with this species in the island of Hawaii.

2. DREPANIS PACIFICA. "Mamo."

Of this extremely rare and apparently extinct species I procured a single specimen from a collection which was formed by Mr. Mills, of Hilo in Hawaii, some thirty years ago or more. The fact of its native name being the same as that of the war-cloaks already spoken of, seems to suggest that they must have received it from this bird, and that probably in olden times they were chiefly wrought of the beautiful golden-yellow feathers from its back, which are much deeper in colour, as they are larger and longer, than the axillary tufts of *Acrulocercus nobilis*.

I could obtain no information as to the period when this species was last observed, but I saw some feather-wreaths ("leis") which were composed of its plumes.

The specimen I brought home has since been beautifully remounted by Mr. Cullingford of Durham, and is now in the Museum of the University of Cambridge. I am not aware of the existence of a second in this country.

3. VESTIARIA COCCINEA. "Iwi."

This beautiful species, which is generally distributed throughout the entire archipelago, is by far the most conspicuous of its birds on account of its gorgeous scarlet plumage, the brilliancy of which is greatly heightened by

the contrast of its deep black wings and tail. It is a bird well known to every Hawaiian, owing to its attractiveness of colour, but still more from the fact that its breast-feathers were largely used in the fabrication of the famous feather capes and helmets of ancient times, which were worn only by the chiefs, and thus its name "Iiwi" occurs in many an ancient tale of Hawaiian chivalry, and in their "meles" or songs, which every native loves so well to chant.

The immature birds are not so well known to the natives, or are else referred by them to a distinct species called in Hawaiian "Iiwipopolo," an error into which Mr. Dole, in his well-known 'Catalogue of Hawaiian birds,' also falls, describing a young specimen of the present species under the name of *Drepanis rosea*; and that he fell into this error is hardly to be wondered at, seeing that the yellowish and spotted plumage of the immature birds is so very unlike that of the adult. The note of the "Iiwi" is a very peculiar one, clear and powerful for so small a bird—*ta-weet, ta-weet, ta-wee-ah*. The flute-like clearness of this call-note is unsurpassed by that of any other Sandwich-Island species.

The "Iiwi" has, however, besides this note a somewhat sweet and plaintive song, which I heard on a few occasions, usually soon after sunrise. The call-note first mentioned is, however, by far the most characteristic, and is the most frequently heard. I regret to say that I did not obtain the eggs of this bird, but I found a nest which seems to have belonged to it. Perhaps I may as well quote from my notes made at the time (June 10, 1887, Kona, 5000 feet):—

"There are a number of stunted ohia trees (*Metrosideros*) growing right among the clinker beds of a comparatively recent lava-flow, which is as yet destitute of any herbaceous vegetation save for a few ferns growing here and there in the crevices of the lava blocks. These trees are a mass of crimson blossom, and among their branches the Iiwi was in great numbers busily engaged in probing the flowers in search of nectar. We found a nest in one of the small trees, which probably belonged to this bird, as it was the only species we observed in this vicinity; and this supposi-

tion is strengthened by the fact of our shooting two quite young birds soon afterwards."

As I feel sure that this nest belongs to *Vestiaria coccinea*, I may briefly describe it as a round and shallow cup, 4 inches in diameter, composed of mosses and dry bents of grass, the inside being lined with slender rootlets.

The food of the Iiwi consists chiefly of honey, which it finds in the blossoms of the ohia; no doubt it also preys on the small insects found in the flowers of this tree; but I should be inclined to say that it lives on honey to a greater extent than does any other Sandwich-Island species; and I am led to this conclusion by the fact that a stream of honey will usually drip from the bill of a freshly killed specimen, which I have but rarely observed to occur in any other species—once only, indeed, with *Himatione sanguinea*, and twice with *Acrulocercus nobilis*.

I have seen this bird at an elevation of 6000 feet in the district of Kona in Hawaii, and I am informed that it is abundant at certain seasons of the year above Kalicha, a sheep-station on the same island at a higher elevation still. The fact to be noted is that *Vestiaria* follows its food, and when the ohia is over at 2000 feet it is in full flower at 5000; thither therefore it migrates.

There is a tree, *Strongylodon lucidum*, found on the island of Hawaii, the scarlet leguminous flowers of which mimic in a most perfect manner, both in colour and shape, the curve of a Iiwi's bill, and is therefore known by the natives by the name of "Nukuiwi" (bill of the Iiwi). I must also note with regard to its vertical range that this bird is frequently to be observed on the sea-beach, to which uncongenial region it is driven by the high winds from its forest home. The same remark applies to the "Apapane," *Himatione sanguinea*.

4. HIMATIONE SANGUINEA. "Apapane."

This species, like the *Vestiaria*, in company with which it is commonly seen, is distributed throughout the whole group, and the vertical range is practically identical. Its

principal food is also honey, which it obtains from the flowers of the ohia; but I have no doubt it feeds also on the small insects with which those flowers abound, and I have often found insects in dissecting it. Although I did not find a nest of the Apapane, I shot a female on May 24th, 1887, at Kaáwaloa, in the district of Kona, in the ovary of which was an egg almost ready for expulsion, a circumstance which enables me to fix approximately its breeding-time, which seems to be rather later than that of the Iiwi, for I had shot several of the young of that species before this date. I never, however, obtained specimens of the Apapane so young as those of the Iiwi, although I have many immature examples in which not a trace of the crimson plumage is to be seen. In this stage they differ so much from the adult (as is also the case with *Vestiaria*) that it is not easy at first to believe they are of the same species, and my natives were quite sure I was wrong when I told them so. The note of the Apapane is a feeble though clear *tweet, tweet*, but it also has a pretty simple song generally heard soon after sunrise or towards sunset. In its flight the white under tail-coverts are very conspicuous and serve to easily determine this species on the wing. I am quite unable to distinguish between specimens from the various islands.

5. *HIMATIONE VIRENS*. "Amakihi" *.

So far as I have observed, this little bird feeds almost entirely on insects and finds its favourite hunting-grounds on the oaka or bastard sandalwood (*Myoporum santalinum*), the alii (*Dodonaea viscosa*), the opiku, the orange, the koa (*Acacia koa*), and the mamané (*Sophora chrysophylla*). It also frequents the ohia, preferring its lower branches and the stunted form of the mountain district. Very unobtrusive in its movements, this species may be seen among the undergrowth of the forest diligently searching every limb and the slenderest branches for its prey. At Mana (3500 feet) in January I found it in great numbers on the mamané trees which abound in that district, and are at that season

* The name applied to most of the yellow-green species of *Himatione*.

in full bloom. I suppose it may occasionally feed on honey, but I never found it so doing, and at any rate it must do so much less than its ally *H. sanguinea*. Moreover it hunts rather among the ground foliage of the trees than the flowering branches. Its commonest note is a low "tweet," which is something like that of a European Goldcrest (*Regulus cristatus*), but it has besides a sweet though short song. It is peculiar to the Island of Hawaii and ranges from the lowest forest-zone to 5000 feet or higher.

6. HIMATIONE CHLORIS. "Amakihi."

This species is found on the islands of Oahu, Molokai, and Lanai, and, I believe, on Maui, but not on Hawaii or Kauai, and I have often with delight watched it searching for its insect food among the low shrubs of ohia which cover the sunny slopes of the ravines on Molokai, an island better known, alas ! to the world as the Leper Island, but which, in my opinion, is the most lovely island of the group. It is seldom visited by travellers on account of the leper-settlement being situated on its shores, and thus the beauties of its forest scenes are but little known. On Oahu, in the district of Halemanu (house of the birds), this species seems to frequent more especially the depths of the steep and densely wooded ravines, and loves above all trees the gigantic *Lobeliaceæ*, the strange foliage and great heads of the purple flowers of which plants are so striking a feature of a Sandwich-Island forest, and one, I believe, only to be met with in these Pacific isles. On the island of Lanai all the specimens which I obtained were shot in some fine guavas quite 30 feet in height, which fringed the edge of the streamlet of the deeply wooded Waiapâa ravine. The birds were so busily engaged in hunting for insects which abound in the guavas, that I had an excellent opportunity of observing their graceful movements. Here I saw the old birds feeding the young with small flies, larvæ, and other insects. Examples of this species obtained on the three islands already named are distinguished from each other according to locality, and I have elsewhere indicated the

differences which enable them to be separated (see P. Z. S. 1889, p. 446). In general appearance a brightly coloured example of this species strongly reminds one of the Willow Wren, particularly in form. I hope in my forthcoming work to figure specimens from the different islands, and thus to aid in distinguishing between the several forms.

The vertical range of the species is from the lowest forest-zone up to 2500 feet.

7. HIMATIONE MACULATA. "Amakihi."

Himatione maculata, Cab. Mus. Hein. i. p. 160 (jr.).

This species is peculiar to the island of Oahu, and is fairly common in the district of Halemanu (house of the birds), where there is still some forest remaining. Of its habits, I have only to remark that they seemed to be identical with those of *Himatione chloris*, but as at the time I did not recognize the fact of their being distinct species, perhaps not much reliance is to be placed on this observation. The specific name applied to this bird is unfortunate, and was founded on immature specimens, as the adult male has no traces of spots. I myself only obtained immature specimens, but thanks to the kindness of the authorities of the Museum of the Academy of Natural Sciences of Philadelphia, I have been enabled to examine an adult male obtained by Townsend, of which the following is a brief description:—Very similar to adult male of *H. chloris*, but with the olive upper plumage darker and tinged with yellow; forehead hardly brighter than the crown of the head, but a distinct though indefinitely marked yellowish streak over the eye; lores brownish black; chin, cheeks, auriculars, and throat clear golden yellow, which colour pervades the breast and belly, becoming very pale, almost white, on the abdomen; lower tail-coverts pale yellow.

8. HIMATIONE MONTANA.

Himatione montana, Scott Wilson, P. Z. S. 1889, p. 446.

This hitherto undescribed species I obtained in the mountain-region at Lanai, at a spot called Lanaihale (the house

of Lanai), at an elevation of about 3000 feet. The brilliant yellow of the underparts of the male caused the late Mr. W. M. Gibson (to whom the greater part of the island of Lanai belonged), in a conversation which I had with him soon after my landing in Honolulu, to refer to this bird as the *Canary-like* Amakihi, and when I held the freshly-killed male in my hand his accurate description of its brilliant yellow colour made me feel sure I had obtained the bird he had spoken of. As I only obtained two specimens, male and female, and these on the same day and in the same locality, I can say nothing of its habits; but I may as well quote from my journal some short notes, taken on the spot where we found this species:—

“1st June, 1888.—To-day we took two natives, one of them armed with an axe with which to clear the path for us. The day was fine, and the trail by which one ascends to the plateau was consequently in good order, and we arrived there without accident. Here we tied up our horses, and then all of us started down a narrow forest-path, the same which we had followed the day before. For a few hundred yards it is very much overhung with ferns (*Gleichenia*) and the climbing tree (*Freycinetia arborea*), and we had to stoop down almost on our knees, which was very tiring work.

“After this thick bit it becomes opener, owing to the number of wild pigs; and here F. and I, with one of the natives, waited, as it was at this spot that Mr. Gibson had shot some birds the previous day. I was very unlucky in shooting several birds which I could not find: Mr. Gibson soon returned with several birds, but of the same species that I had already obtained in Hawaii. From here we started about 12 o'clock, following the path, to try to make the summit of the mountain. The path soon emerges from the thick scrub and comparatively tall trees on to a plateau, where the scrub only reaches one's knees. From this open plateau we had a magnificent view of the west side of the island, with Molokai and Maui in the far distance, surrounded by a bright blue sea. The path then ascends gradually till we reach a point overlooking Palawai Valley,

which looks a mere dot in the landscape, so far is it below us. We followed the path a little higher, where it becomes very steep, and the rich light-yellow soil is very slippery from here to the top of the mountain; the ohia and other trees are here of considerable size, but we could neither hear nor see any birds. However, at a point called Lanaihale, on our return journey, I caught sight of a bright yellow bird in an ohia bush, a few yards down the side of the gulch: I put my gun instantly to my shoulder and fired, down came the bird; F. and I scrambled down the gulch, and fortunately found it. Its breast was of a brilliant yellow, far brighter in tint than the plumage of any other species I have as yet obtained; its legs and bill were a light pink; in dissecting it I found some small larvæ."

No words of mine can convey an idea of the difficulties and dangers of collecting in the mountains of Lanai, difficulties due to the almost impenetrable bush which covers the mountain-plateau, to the fogs which render riding extremely dangerous, and to the rains which make the nearly perpendicular mountain-trails dangerous even to a sure-footed Lanai horse. Indeed, hardened as I was to "steep bits" in my island travels, I must confess that the first trip we made into these mountains surprised me. I must here mention that the discovery of this interesting species is due to the kindness of my friend Mr. Henry Gibson, in kindly acting as our guide on our explorations of these mountain-regions, and also to Mr. Jesse Moorhead's unvarying kindness to me during a stay of some weeks' duration under Mr. F. H. Hayselden's hospitable roof.

GENUS HEMIGNATHUS. "Akihiloa."

Thanks to the authorities of the Museums of Liverpool and Berlin, I have been able to demonstrate, I think indubitably, the existence of *six* perfectly distinct species of this remarkable genus in place of the two, or at most three, which had been before recognized. The paper containing my remarks on the subject was printed in 'The Annals and Magazine of Natural History' (ser. 6, vol. iv. pp. 400-402) for November

1889, and I here need only give a brief summary of the chief facts. I found each of the islands of Hawaii and Kauai to be inhabited by two distinct species, a large one and a small one, and obtained examples of all four; while I have ascertained that the island of Oahu also had two other species, specimens of which I have examined, though I myself did not meet with a single bird of the genus there, owing, no doubt, to the destruction of the forests on that island. These six species are as follows:—

- | | |
|------------------------------------|-----------|
| 1. <i>H. obscurus</i> (Gmel.). | } Hawaii. |
| 2. <i>H. olivaceus</i> (Lafr.). | |
| 3. <i>H. lichtensteini</i> , mihi. | } Oahu. |
| 4. <i>H. lucidus</i> , Licht. | |
| 5. <i>H. stejnegeri</i> , mihi. | } Kauai. |
| 6. <i>H. hanapepe</i> , mihi. | |

Of which nos. 2, 4, and 6 may be regarded as belonging to the subgenus *Heterorhynchus*. All the birds of this genus are very shy and difficult of approach, and consequently my notes on their habits are meagre; but as no observations of the kind seem to have been ever made before, my own will be almost like the breaking of new ground. I propose to treat of these species according to what seems to be their affinity, and begin with No. 1 of the above list, which, as it happens, is also the species which has been known for the longest time: indeed Latham's type specimen, procured on Cook's third voyage, when the Sandwich Islands were first discovered, still exists in very decent condition in the Liverpool Museum, and through the kindness of Mr. T. J. Moore I have been able to compare it with my own specimen obtained over one hundred years later.

9. HEMIGNATHUS OBSCURUS.

Hookbilled Green Creeper, Latham, Synops. i. p. 703.

Certhia obscura, Gmelin (*ex* Latham).

This is the larger of the two species peculiar to the Island of Hawaii, where it occupies the lower forest-zone, say from 1100 to 2500 feet, among the large ohia trees. It invariably chooses a rotten or half-dead tree for its hunting-ground, and

this, I imagine, is because its slender bill, of which the maxilla does not very greatly exceed the mandible in length, requires soft material to attack.

It is more unobtrusive and quiet in its movements than any other member of the genus which I saw, and its sombre colour is so nearly that of the tree-trunks, that but for its clear and characteristic call-note, I doubt whether I should have obtained a single example. At Olaa in the district of Puna, a place renowned in ancient times for its bird-catchers, lived, when I was there, an old native, by name Hawelu, an excellent observer and well skilled in the almost forgotten art*, who told me that this was an extremely rare species.

It was he who obtained the only specimens known to be in existence of the "Moho," or short-winged Rail, of which one was exhibited by Prof. Newton at a meeting of the Zoological Society in January, 1889 (Proc. Zool. Soc. 1889, p. 5) †.

10. HEMIGNATHUS LICHTENSTEINI.

Hemignathus lichtensteini, Wilson, Ann. & Mag. N. H. ser. 6, vol. iv. p. 401.

H. obscurus, Lichtenstein, Abhandl. k. Akad. Berlin, 1838, p. 449, t. v. fig. 1 (*nec* Gmelin).

This species, mistaken by Lichtenstein for the last, was obtained by Deppe in Oahu many years ago. I did not meet with it in a brief expedition made in the remaining forests in that island, and I believe that it must be nearly, if not quite, extinct. I am only aware of the existence of a single specimen—the type, which Prof. Möbius most kindly gave me the opportunity of comparing with the true *H. obscurus*. Unfortunately it seems to be a female.

11. HEMIGNATHUS STEJNEGERI. (Plate VI. fig. 2.)

Hemignathus obscurus, Stejneger, Proc. U.S. Nat. Mus. 1887, p. 93 (*nec* Gmelin, *nec* Licht.).

* Poor Hawelu, since my return to England, has been removed to Molokai as a leper.

† This species received from Mr. Dole the name of *Pennula millsii* (see Ibis, 1880, p. 241); but it is undoubtedly the "Rail with very short wings and no tail" of Captain King (see the narrative of Cook's 'Third Voyage,' vol. iii. p. 119), whose name for it, *Rallus ecaudatus*, applied in 1784, antedates even that of Gmelin. Cf. Newton, P. Z. S. 1889, p. 5.

H. stejnegeri, Wilson, Ann. & Mag. N. H. tom. cit. p. 400.

Of this well-marked species, which I am now enabled to figure for the first time, Mr. V. Knudsen sent specimens to Dr. Stejneger, who showed them to me in Washington, and described them, though with some doubt, as belonging to *H. obscurus*. Having met with that species on Hawaii, it was plain to me, so soon as I got the present one in Kauai, that they were absolutely distinct, and as such I have described them, dedicating this one to Dr. Stejneger, who has done so much for the ornithology of the Sandwich Islands that he well deserves the honour of having this finest species of the genus named after him.

In regard to its habits I cannot give much information, as it is a very scarce bird and shy of approach. It lives on insects, which it finds under the bark of half-rotten trees, particularly of the ohia, the chief forest-tree on Kauai, the island to which this species is peculiar, and it there seems to range from the lowest forest-zone to 3000 feet or perhaps higher, the greatest height on Kauai (Waialeale) being 4000 feet.

Through the kindness of Prof. Möbius, I have been able to state that the *Hemignathus procerus* of Prof. Cabanis—a description of which I have not yet been so fortunate as to meet with—is identical with *H. stejnegeri*.

Being thus furnished with the species of *Hemignathus* proper, I now come to those which may form the subgenus *Heterorhynchus*, and the first of these, I take, is

12. HEMIGNATHUS OLIVACEUS.

Heterorhynchus olivaceus, Lafr. Mag. de Zool. 1839, pl. x.; Rev. Zool. 1840, p. 321.

This is the second and smaller species of the Island of Hawaii, to which I believe it to be peculiar, and the first specimens of it that I obtained were from the district of Kona at a height of about 5000 feet. In this district it frequents only the koa trees, running up and along their great smooth trunks and limbs in its search for insects. In the mamané woods, near Mana, I subsequently found it in con-

siderable numbers in the month of January, when these trees are in full flower, resembling laburnums with their golden clusters. The bark of large examples of this tree is easily detachable, but although I was never able to approach near enough to watch the precise way in which the extraordinarily-shaped bill of this species is brought into play, I conclude that therewith it does detach the bark, and then seizes the insects beneath with its long tongue.

13. *HEMIGNATHUS LUCIDUS*.

Hemignathus lucidus, Licht. Abhandl. Akad. Berl. 1838, p. 451, t. v. figs. 2, 3.

This species has been most wrongly confounded with the preceding, as anyone may perceive who examines specimens of the two, for the present has by no means the same very remarkable form of mandible as *H. olivaceus*. I hope to give figures of both in my forthcoming work. *H. lucidus* formerly inhabited Oahu, but I did not meet with it, and fear that, like *H. lichtensteini*, it may have become extinct; there are, however, many more specimens of *H. lucidus* existing in collections than of *H. lichtensteini*.

14. *HEMIGNATHUS HANAPEPE*. (Plate VI. fig. 1.)

Hemignathus hanapepe, Wilson, Ann. Mag. N. H. tom. cit. p. 401.

This species is the only one of the genus to which the natives have given a different name—"Akihiloa," or "Aki-aloa, as it is often called, being applied by them to all the rest, while "Nukupuu" (from *Nuku*, bill) is used for this alone. That it is a very scarce bird in the forests of Kauai is pretty clearly shown by the fact that my friend Mr. Francis Gay, of Makaweli, in that island, who for some years past has paid attention to its birds, had never seen specimens of this one, until I showed him those which I had been fortunate enough to procure in the forest surrounding the little mountain-house belonging to the Sinclair family in the district of Hanapepe, after which I named my new discovery. In this house, to which Mr. Robinson most kindly accompanied me, some five hours' ride from any other habitation, and at an

elevation of some 3000 feet, I stayed for ten days. It is completely surrounded by forest on three sides, but on the fourth has a fine outlook to the sea, and across a stupendous and thickly-wooded ravine, which separates the mountain-plateau from that on which Mr. Knudsen's small mountain-residence is situated, and where he forms the collections he has sent to Dr. Stejneger in Washington.

In coloration this species much approaches *H. olivaceus*, but differs chiefly in the form of its bill. The male, as will be seen by the Plate (Plate VI. fig. 1), shows a very brilliant yellow, and I may say that on this account when I shot my first specimen, which was on a lofty ohia tree, I thought it was a *Himatione parva*, and was therefore greatly delighted to find, in picking it up, that I had secured a specimen which was quite new to me. It was, however, known to my native guide, who at once gave me his name for it; and this, as I subsequently learned through Mr. Gay, was correct.

The female, which I intend to figure in my work, is of a much duller colour, and the slaty colour of her upper parts enables one to distinguish her easily enough even when she is engaged in hunting for insects at a great height from the ground. I am assured by the natives that this species also lives upon oranges and bananas, and I have every confidence in the assertion.

15. OREOMYZA BAIRDI. "Alakihi."

This species was first obtained by Mr. Knudsen in Kauai, to which island it is peculiar, and an excellent description given of it by Dr. Stejneger (Proc. U.S. Nat. Mus. x. pp. 99, 100), to which I can only add that the bill is light brown tinged with pink, and the legs are light pink. It is usually met with in small flocks of from eight to twelve, and is a particularly active bird in running up and down the limbs and trunks of the high trees in search of insects. Its short tail, in Dr. Stejneger's opinion, indicates its terrestrial habits; but I only observed it at some considerable height from the ground, in the lofty ohia trees, for the dead branches of which it evinces a decided preference. It is the most active

bird of the Hawaiian forests in its movements, and from its short tail and compact form bears a decided resemblance to our Nuthatch (*Sitta europæa*). Its note is a simple *twit, twit, twit*, repeated constantly.

It seems to range to the elevation of 3000 feet.

Some examples of this bird have the forehead white, and Dr. Stejneger, in a letter to Professor Newton, raises the question of there being two distinct species. I do not think there is more than one species, as all my examples were obtained in one locality; but at the same time the variation in plumage does not seem to be due to sex.

16. PSITTIROSTRA PSITTACEA. "Ou."

This well-known species is distributed throughout the group, and I obtained specimens from every island, save from Oahu, where I have good reason to believe it has become extinct, or else extremely scarce. I do not detect any appreciable difference between specimens from the various islands, although I think those I obtained on Lanai are brightest in plumage. The size and shape of the curiously-formed bill of this species varies considerably, especially in the males, in some of which the maxilla is remarkably elongated and decurved.

Next to *Vestiaria coccinea* it is perhaps the most noticeable of the forest-birds of the islands, the bright yellow head and neck of the adult males rendering them very conspicuous in their straight dashing flight from tree to tree. The immature males and the females, which want this distinctive feature, might easily be mistaken for the sombre-clad *Phæornis obscura*, but the constant twittering the Ou almost invariably makes while feeding at once betrays its identity. Freshly killed examples possess a peculiar scent, which I did not observe as belonging to any other forest-dwelling species, and which is probably due to their extremely varied fruit-diet. Necklaces ("leis") used sometimes to be made from the bright green feathers of the back and underparts of this bird, but they were commonly used in combination with the black feathers of *Acrulocercus nobilis* and the scarlet feathers of *Vestiaria*

coccinea. I saw a feather wreath thus made at Olaa, in the district of Puna, which I attempted to purchase; but the native woman wanted a very high price for it, which I was disinclined to give. Though *Psittirostra*, as remarked above, is generally distributed throughout the group, in no districts does it seem to be abundant. I think that the locality, in which I found it in the greatest numbers was among the trees clothing the abrupt sides of the deep ravine which runs down to the leper-settlement on the island of Molokai. Very lovely these little birds looked, flying continually to and fro, up and down this stupendous gorge, their yellow necks flashing in the bright sunlight, as they darted out from among the dark green ohias or from the silvery foliage of the kuhui (*Aleurites triloba*).

The food of *Psittirostra* consists entirely of fruits, and chiefly of that of the *Freycinetia arborea*, the ripe red seeds of which I in most cases found when dissecting them. I noticed also, particularly in one locality, on the outskirts of a forest in the district of Kona, that a very large proportion of the fruits of this climber were eaten away at the apex, and in this wood *Psittirostra* was especially abundant. I, however, shot examples as they were busily engaged in feeding on the small crimson fruit of the wild mulberry (*Morus papyrifera*), the juice of which had dyed their throats a deep crimson. In districts where the guava is found, *Psittirostra* also feeds on its fruits; and I kept one alive for several days, feeding it solely on the fruit of this tree.

The vertical range of this species extends from the lowest forest-zone up to 3000 feet.

17. PHÆORNIS OBSCURA. "Omao."

This sombre-coloured bird is still fairly common in the forests of Hawaii, while a very nearly allied species, *P. myadestina*, recently described by Dr. Stejneger (Proc. U.S. Nat. Mus. x. p. 90), inhabits the island of Kauai. The Omao is a very tame bird, and though it does not court mau's society, it shows little fear of him. Indeed, it was no uncommon occurrence for one to alight within a few yards of

me and begin its melodious song, which much resembles that of our Common Thrush, though inferior in volume. It is, nevertheless, so varied and sweet, that the bird is fairly entitled to be called Hawaii's Nightingale. Mr. D. H. Hitchcock of Hilo told me that many years ago the natives used to bring him the young of this species, which, for the sake of their song, he kept in a cage.

The habit of singing, like a Lark on the wing, possessed by *P. myadestina*, as mentioned by Dr. Stejneger on Mr. Knudsen's authority, was observed by me in both species; but the gentleman last named is incorrect in applying the name of "Uapauau" or "Ou" to the one recently described. The call-note of *P. obscura* is a particularly clear *tweet*, very easily recognized, but it also utters a very remarkable hissing sound when approached. Its flight is slow, and I have frequently shot it as it was flying from tree to tree. It possesses also the very peculiar habit (not noticed by Mr. Knudsen in regard to *P. myadestina*) of shaking its wings when perched on a branch, as if it were shivering with cold or seized with an attack of ague.

The vertical range of this species extends from the lowest forest-zone up to 5000 feet.

XVII.—On the Development of the Feet of *Cypselus melba*.

By L. ZEHNTNER, Cand. Phil., of Bern.*

BEING at present engaged in a study of the development of *Cypselus melba*, especially directed towards the elucidation of its osteological peculiarities, I publish the following interesting results, reserving details for a forthcoming work.

As is well known, the genus *Cypselus* is distinguished from all others by the remarkable reductions in the feet. According to Huxley's law, we find in birds the first toe provided with two, the second with three, the third with four, and the

* Translated (by permission) from a paper in the 'Zoologischer Anzeiger' (No. 319, 1889), entitled "Zur Entwicklung von *Cypselus melba* (Alpensegler)," von L. Zehntner, Cand. Phil. in Bern.



J. G. Keulemans del. et lith.

Mintern Bros. imp.

1. HEMIGNATHUS HANAPEPE, ♂.

2. HEMIGNATHUS STEJNEGERI, ♂.